

REMARKS/ARGUMENTS

Claims 1-23 are pending in the present application and stand rejected.

Claims 1, 3-5, 7-15, 18 and 23 are rejected under 35 U.S.C. §103(a) as unpatentable over United States Patent Application Publication No. 2002/0078296 to Nakamura et al. (hereinafter "Nakamura") in view of United States Patent 6,859,865 to De Margerie et al. (hereinafter "De Margerie") and a further in view of United States Patent Application Publication No. 2002/0083263 to Fukuzumi.

Claims 19, 20, and 22 are rejected under 35 U.S.C. §103(a) as unpatentable over Nakamura in view of De Margerie and a further in view of Fukuzumi and further in view of United States Patent Application Publication No. 2002/0122601 to Peng.

Claim 21 is rejected under 35 U.S.C. §103(a) as unpatentable over Nakamura in view of De Margerie and further in view of Fukuzumi and further in view of Peng and further in view of United States Patent Application Publication 2003/0198250 to Hakenberg et al. (hereinafter "Hakenberg").

Claims 6 and 16-17 are rejected under 35 U.S.C. §103(a) as unpatentable over Nakamura in view of De Margerie and further in view of Fukuzumi and further in view of United States Patent Application Publication No. 2003/0028737 to Kaiya et al. (hereinafter "Kaiya").

By this paper, Applicant amends claims 1, 10, and 19. Claim 1 is amended, in part, to include the limitations previously recited in claims 3-5. Claims 3-5 are canceled without prejudice or disclaimer. Claim 10 is amended, in part, to include the limitations of claim 15. Claim 15 is canceled without prejudice or disclaimer. Claim 19 is amended, in part, to include the limitations of claim 21. Claim 21 is canceled without prejudice or disclaimer. In addition, claims 22-23 are canceled. Support for the claim amendments can be found throughout the application. Among other places, support can be found at paragraphs [0079]-[0088]. No new matter has been added.

Applicant wishes to direct the Examiner's attention to the structure of the claimed inventions. At least three distinct storage subsystems are recited in each of the claims. These include a primary storage subsystem, a secondary storage subsystem, and an intermediate storage subsystem. The intermediate storage subsystem is coupled to the primary and secondary storage subsystems, but it is not directly coupled to a host unit. The intermediate storage subsystem receives write data synchronously from the primary storage subsystems and imposes a write-order upon the received data. The secondary subsystems receive the write data asynchronously from the intermediate storage subsystem. As discussed below, Applicant respectfully submits that the various combinations of cited references do not disclose at least these features.

Claim 1

Claim 1 recites a remote copy system including first and second primary storage subsystems, first and second secondary storage subsystems, and an intermediate storage subsystem. The intermediate storage subsystem is "configured to synchronously receive the write data from the first and second primary storage subsystems" and comprises "first and second intermediate volumes defined as a consistency group within which data integrity is guaranteed." The first and second secondary storage subsystems are "coupled to the intermediate storage subsystem and configured to asynchronously receive the write data from the intermediate storage subsystem...wherein the write data are stored in the first and second secondary storage subsystems according to the write order information associated with the write data as generated by the write-order-information provider of the intermediate storage subsystem."

Claim 1 further recites that the first and second secondary storage subsystems are separate from the intermediate storage subsystem ("the first primary storage subsystem which is a separate storage subsystem from the intermediate storage subsystem...the second primary volume of the second primary storage subsystem which is a separate storage subsystem from the intermediate storage subsystem") and that the intermediate storage subsystem is not directly coupled to a host unit.

In addition, as amended, claim 1 recites "the intermediate storage subsystem transmits a request to prepare the write data and transmits a request to validate the write data

which has been prepared according to the prepare request, based on a value of the valid counter." Applicant respectfully submits that the cited references, taken alone or in combination, do not teach or suggest at least these elements.

The Office Action cites Nakamura as teaching the structural elements of claim 1 including primary, secondary, and the intermediate storage subsystems. In particular, the Office Action maintains that these elements are disclosed in Figure 1 of Nakamura. See, Office Action at pp. 2-3. Applicant is unclear as to precisely which elements of Nakamura are intended to correspond to the claimed storage subsystems. However, Applicant respectfully notes that Figure 1 of Nakamura shows only two storage subsystems. These include disk subsystem 102 and disk subsystem 104. With respect to disk subsystem 104, Nakamura specifically states that storage volumes 111 (S-VOL) and storage volumes 112 (T-VOL) are part of the same disk subsystem. See, Nakamura at ¶37. Thus, Figure 1 of Nakamura does not teach or suggest at least three distinct storage subsystems as claimed.

Moreover, as Nakamura shows in Figure 1, disk subsystem 102 and disk subsystem 104 are directly coupled to host units 105 and 106 respectively. Thus, Applicant respectfully submits that Figure 1 of Nakamura does not disclose an intermediate storage subsystem that is distinct from disk subsystem 102 and disk subsystem 104 and which is not directly coupled either to host unit 105 or host unit 106. Since an intermediate storage subsystem is not shown, it follows that Figure 1 also fails to disclose that an intermediate storage subsystem receives data synchronously from a primary storage subsystem and that a secondary storage subsystem receives data asynchronously from the intermediate storage subsystem. Finally, Figure 1 of Nakamura does not disclose an intermediate storage subsystem which includes a valid counter and which transmits 'requests to prepare' and 'requests to validate' as recited above.

De Margerie does not cure these deficiencies. As illustrated in Figure 1, De Margerie discloses a primary storage controller 24 coupled to storage device 22 and a remote storage controller 34 coupled to storage device 32, each of which may include redundant elements. De Margerie does not disclose an intermediate storage subsystem that is distinct from

primary storage controller 24 and the remote storage controller 34. Thus, even if De Margerie teaches synchronous communication between a storage consumer 20 and primary storage controller 24 and/or synchronous communication between primary storage controller 24 and remote storage controller 34, it fails to disclose an intermediate storage subsystem which communicates both synchronously and asynchronously with different storage subsystems as claimed. Accordingly, Applicant respectfully submits that the combination of Nakamura and De Margerie fails to teach or suggest at least the features as previously recited.

Finally, the Office Action cites Fukuzumi for disclosing a buffer memory coupled between a host unit and a flash memory. See, Office Action at p. 5. Applicant is unclear as to the intended application of Fukuzumi's buffer memory to the claim language. As best understood, Fukuzumi is concerned with reducing the cost of flash memory devices by outfitting them with a small capacity buffer. In any event, Applicant respectfully submits that Fukuzumi does not disclose an intermediate storage subsystem as claimed and therefore does not cure the deficiencies previously identified. In particular, Fukuzumi does not disclose primary, secondary, and intermediate storage subsystems or that an intermediate storage subsystem includes a valid counter and transmits 'requests to prepare' or 'requests to validate' as recited in the claim. For at least these reasons, it is submitted that Nakamura, De Margerie, and Fukuzumi fail to disclose each and every claimed element and thus fail to render claim 1 obvious. Reconsideration and allowance of claim one is respectfully requested.

Claims 10 and 19

Claims 10 and 19 recite limitations similar to those discussed in connection with claim 1 and each is believed allowable over Nakamura, De Margerie, and Fukuzumi for at least the reasons previously given. With regard to claim 19, the Office Action additionally cites Peng as teaching a computer-readable medium based upon its disclosure of a computer program. See, Office Action at p. 14. Applicant respectfully submits that Peng is directed to a scalable MPEG-2 decoder and does not cure the storage-subsystem deficiencies of the other combined references. Reconsideration and allowance of claims 10 and 19 is respectfully requested.

Dependent Claims

Claims 6-9 depend from claim 1. Claims 11-14 and 16-18 depend from claim 10. Claims 20-21 depend from claim 19. Each of the dependent claims incorporates all of the limitations of its respective base claim. Each dependent claim is therefore believed allowable over the cited references for at least the reason that it depends from an allowable base claim. Applicant has also reviewed tertiary references Hakenberg and Kaiya and respectfully submits that, taken alone or in combination with other references, Hakenberg and Kaiya fail to cure the deficiencies previously discussed. Accordingly, reconsideration and allowance of all pending claims is respectfully requested.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance and an action to that end is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 858-350-6100.

Respectfully submitted,



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